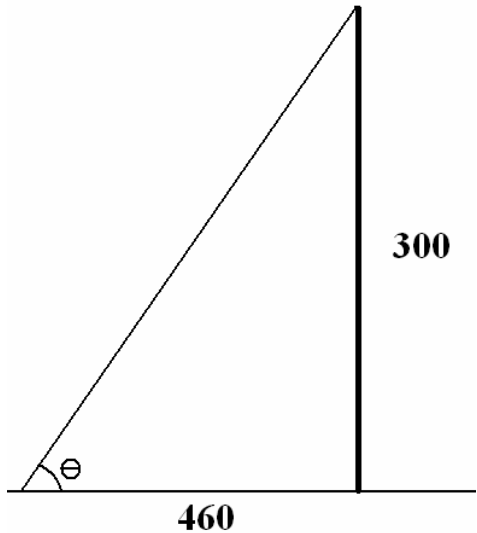


## QUESTION OF THE DAY

**Problem:** A tower that is 300 feet tall is stabilized by taught guy wires that are attached to the ground a distance of 460 feet from the base of the tower. Find the angle of inclination,  $\theta$ , and the length of the guy wire.

**Solution:** The first step is to draw a sketch. This will greatly simplify the calculations



To find  $\theta$ , use the definition of tangent, which is

$$\tan \theta = \frac{\textit{Opposite}}{\textit{Adjacent}}$$

Therefore,  $\tan^{-1}\left(\frac{\textit{Opposite}}{\textit{Adjacent}}\right) = \theta$ . In this situation, the opposite side is 300 feet and the adjacent is 460. So we have

$$\tan^{-1}\left(\frac{300}{460}\right) = \tan^{-1}(0.65217) = 33.11^\circ$$

To find the length of the guy wire, use either the definition of cosine or the definition of sine. We will use cosine.

Thus, we have  $\cos \theta = \frac{\textit{Adjacent}}{\textit{Hypotenuse}}$ , where the hypotenuse is the length of the guy wire.

$$\text{Rearranging this we get } \textit{Hypotenuse} = \frac{\textit{Adjacent}}{\cos \theta} = \frac{460}{\cos(33.11^\circ)} = 549$$

The angle of inclination of the guy wire is about 33 degrees and it is about 549 feet long